

18. The program storage device according to claim 1, wherein training cases are ignored only if they contain missing values in data fields that are required not to have missing values by the application conditions of the subordinate model being constructed.

19. The program storage device according to claim 1, wherein data fields that contain missing values are ignored in the construction of only subordinate models, and wherein a missing value deemed to be informative is treated as a legitimate data value

20. The program storage device according to claim 1, wherein said method is devoid of filling in missing values with an imputation procedure, a weighting scheme to compensate for the presence of missing data, and introduction of free parameters into the subordinate model to represent missing data. --

REMARKS

Claims 1-20 are all of the claims presently pending in the application. New claims 3-20 have been added to more completely define the invention.

Claims 1-2 stand rejected only under 35 U.S.C. §101. There are no prior art rejections. Further, Applicant gratefully acknowledges the Examiner's indication that claims 1-2 would be allowable if the above-mentioned §101 rejection is overcome.

The §101 rejection is respectfully traversed in view of the following discussion, and thus the application is believed to be in condition for allowance.

I. THE CLAIMED INVENTION

Applicant's invention, as disclosed and claimed, is a program storage device (e.g., diskette, hard drive, optical disk, etc. as is commonly known to one of ordinary skill in the art) for storing method steps of a program.

The method is for constructing predictive models that can be used to make predictions in situations where the inputs to those models can have values that are missing or are otherwise unknown.

That is, the method includes presenting a collection of training data comprising

examples of input values that are available to the model together with corresponding desired output value(s) that the model is intended to predict, and generating a plurality of subordinate models, that together comprise an overall model. Each subordinate model has an associated set of application conditions that must be satisfied in order to apply the subordinate model when making predictions.

The application conditions include tests for missing values for all, some, or none of the inputs, and tests on the values of all, some, or none of the inputs that are applicable when the values of the inputs mentioned in the tests have known values.

For at least one subordinate model, the training cases used in the construction of that subordinate model include some cases that indirectly satisfy the application conditions such that the application conditions are satisfied only after replacing one or more known data values in these training cases with missing values.

Further, as exemplarily defined by independent claim 1, the method further includes *“outputting a specification of at least one of said subordinate models thus generated and making a prediction based on said at least one of said subordinate models thus-generated.”* In one embodiment, the specification of a plurality of subordinate models and their associated application conditions, are output to a storage device for being read by the machine, thereby enabling the plurality of models to be readily applied to generate predictions.

With the unique and unobvious features of the claimed invention, the method can realize significant advantages because it can be readily applied in conjunction with any known method for constructing models, including ones that require all input values to be known, thereby yielding combined methods for constructing models that tolerate missing values.

In an exemplary embodiment, the method and storage device storing the method, can be utilized in combination with classification and regression trees, classification and regression rules, or stepwise regression (e.g., see page 9 of the present specification).

II. THE §101 REJECTION

Claims 1-2 stand rejected under 35 U.S.C. §101. Specifically, the Examiner asserts that:

As discussed below, claims 1-2 are rejected under 35 U.S.C. 101, as failing to meet one or more guidelines enumerated in "Examination Guidelines for Computer-Related Inventions" (the "Guidelines"), published in the Federal Register and available on the World

Wide Web at:

<http://www.uspto.gov/web/offices/com/hearings/software/analysis/computer.html>

5.2 Product claims 1-2 are rejected because the underlying process invention comprises an abstract idea.

5.3 Regarding Claim 1, this claim is directed to "A program storage device readable by a machine, tangibly embodying a program of instructions executable by the machine to perform method steps for constructing predictive models", and the steps recited in Claim 1 describe mathematical operations comprising the abstract idea of generating models that account for missing or otherwise unknown data values.

For the purposes of examination, the "device" of claims 1-2 will be read broadly to comprise a product claim that encompasses any and every computer implementation of a process. Neither the detailed description of the invention nor the drawings supply any tangible description of a computer implementation of the invention.

In this situation, the following paragraph in the Guidelines at IV.B.2.(a)(ii) appears controlling:

If a claim is found to encompass any and every product embodiment of the underlying process, and if the underlying process is statutory, the product claim should be classified as a statutory product. By the same token, if the underlying Process invention is found to be non-statutory, Office personnel should classify the "product" claim as a "non-statutory product." If the product claim is classified as being a non-statutory product on the basis of the underlying process, Office personnel should emphasize that they have considered all claim limitations and are basing their finding on the analysis of the underlying process.

[Emphasis supplied.]

Therefore, Claim 1 is rejected as being classified as a non-statutory product because the underlying process invention as claimed by Applicant is non-statutory. The method steps in Claim 1 do not: (1) recite data

gathering limitations or post-mathematical operations that might independently limit the claims beyond the performance of a mathematical operation; or (2) limit the use of the output to a practical application providing a useful, concrete, and tangible result.

5.4 *Regarding Claim 2, the limitations supplied in this claim does not: (1) recite data gathering limitations or post-mathematical operations that might independently limit the claims beyond the performance of a mathematical operation; or (2) limit the use of the output to a practical application providing a useful, concrete, and tangible result. The analysis and conclusion regarding non-statutory subject matter is identical to Claim 1 above.*

Applicant respectfully disagrees. More specifically, the Office Action asserts that applicants have disclosed methods and apparatuses for using a computer but no practical application is discussed in the specification or in the claims. Furthermore, the specification and claims merely discuss performing the abstract idea of generating models that account for missing or otherwise unknown data value. The Office Action asserts that no practical application of the invention is discussed, that none of the embodiments performs any post-computational processing activities, and that data is not extracted from a mathematical calculation to be manipulated to achieve a practical activity.

First, for the record, Applicants submit that the Office Action references an improper standard with respect to 35 U.S.C. §101.

Applicant notes the Federal Circuit's relatively recent decision in AT&T Corp v. Excel Communications, 50 USPQ2d 1447 (Fed. Cir. 1999) (hereafter AT&T v. Excel). This case discusses the current status of 35 U.S.C. §101. Id at 1451. The Federal Circuit states that a process that applies an equation to a new and useful end is at the very least not barred by the threshold by §101. Furthermore, a claimed processing system for implementing a financial management system (as in State Street) constituted a practical application of a mathematical algorithm by producing "a useful, concrete and tangible result." Id at 1451. Furthermore, in discussing State Street, the Federal Circuit held that there was patentable subject matter because the system takes data representing discrete dollar amounts through a series of mathematical calculations to determine a final share price, which was considered a useful, concrete and tangible result. See page 1452.

The Court also suggests that the notion of a physical transformation (as alluded to in the present Office Action) is but one example of how a mathematical algorithm may bring about a useful application. Therefore, applicants submit that the Office Action makes an improper rejection under 35 U.S.C. §101. Patentability under 35 U.S.C. §101 requires a determination of whether a useful, concrete and tangible result is accomplished by the claimed features. Applicants submit that they have developed a useful, concrete and tangible result from the claimed features, the utility being clearly described in the application.

As mentioned above, the present invention relates to method for constructing a predictive model that can be used for making predictions (e.g., reliable ones on which a decision may be based) even when the values of some or all inputs are missing or are otherwise unknown. See pages 1, lines 9-12; page 2, lines 9-14, etc.). Accordingly, the present invention provides a predictive model which is superior to the prior art and which can make superior predictions from those of the prior art models, even when some or all data values are unknown or missing. This obviously relates to making real-world predictions for real-world problems and decisions. Indeed, on pages 1-2 a real world application of direct-mail targeted-marketing purposes in industries that sell directly to consumers. Clearly, such an application is a useful, concrete and tangible result especially in the direct-mail industry.

Furthermore, the present application discusses the problems of the prior art and how the present invention overcomes such problems (and in some cases can be used with the conventional methods of model generation) (e.g., see pages 2-7 and 23-26 of the present application).

Pages 10-22 describe features of the present invention and the respective features that obtain the objectives of the present application. The detailed description discusses the use of the invention in the form of a special apparatus or computer program executed in a generally used computer (e.g., see page 19, lines 22-24). One skilled in the art would clearly understand that this stored data may be read from the computer such as on a display unit, an output unit such as a printer, etc. Clearly, the generation of such predictive models provides a useful, concrete and tangible result for at least the direct-marketing industry (e.g., see page 1, line 29 to page 2, line 4). Indeed, such predicative models allow predictions to be generated with increased reliability despite their being missing values (e.g., possibly missing

demographic, credit or other data inputs), and allows a greater return on marketing investments in this particular application.

The claims describe the program storage device for storing the method for constructing predictive models that can be used for making such predictions despite the presence of missing data values. The generation of a predictive model is patentable subject matter if it is a practical application that produces a useful, concrete and tangible result. See AT&T v. Excel. It is clear that this invention as a whole is applied in a useful manner, as described above (i.e., it is useful to generate a predictive model which will generate predictions having increased reliability and upon which marketing and financial decisions may be made). The independent claims set forth very detailed steps of how to arrive at this result so as to avoid problems of the prior art.

There is no requirement that the claims set forth any post-computational activity as asserted in the Office Action. Rather, as discussed on page 1452 of AT&T v. Excel, a physical transformation is merely one example of how a mathematical algorithm may bring about a useful application. In this application, the construction of the subordinate models (e.g., as defined in (2) in independent claim 1) and specifically the testing of inputs, and treatment of known data values and missing values in the claim results in the construction of a model which has increasingly reliable predictions as compared to the prior art and which avoids the problems of the prior art. By avoiding these problems, the present application provides a useful, concrete and tangible result and therefore the requirements of 35 U.S.C. §101 are met. Withdrawal of the rejection is respectfully requested.

Furthermore and notwithstanding the above, to expeditiously dispose of this issue and to pass the case to allowance, claim 1 has been amended for the benefit of the Examiner to recite "outputting a specification of at least one of said subordinate models thus generated and making a prediction based on said at least one of said subordinate models thus-generated". This clearly defines a "post-computation/mathematical operation processing" and clearly the subject matter of independent claim 1 (and claim 2 which depends from claim 1) is statutory and allowable over the prior art of record.

In view of the foregoing, the Examiner is respectfully requested to reconsider and withdraw this rejection.

New dependent claims 3-20 have been added and like claims 1-2 are clearly patentable over the prior art of record.

III. FORMAL MATTERS AND CONCLUSION

The disclosure has been amended to overcome the Examiner's objection thereto. Further, it is noted that it is the claimed invention which determines the inventorship, not necessarily the disclosure itself. Thus, the present inventorship is believed by the undersigned to be proper.

Further, pursuant to the Examiner's request on page 2 of the Office Action, the references are not currently readily available to the undersigned, but the undersigned will endeavor to supply the references requested by the Examiner, if judged by Applicant to be relevant to the claimed invention. Certainly, Applicant is cognizant of its continuing duty under 37 C.F.R. §1.56.

In view of the foregoing, Applicant submits that claims 1-20, all the claims presently pending in the application, are patentably distinct over the prior art of record and are in condition for allowance. The Examiner is respectfully requested to pass the above application to issue at the earliest possible time.

Should the Examiner find the application to be other than in condition for allowance, the Examiner is requested to contact the undersigned at the local telephone number listed below to discuss any other changes deemed necessary in a telephonic or personal interview.

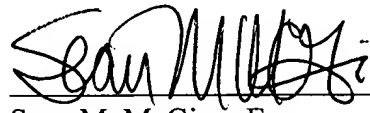
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The Commissioner is hereby authorized to charge any deficiency in fees or to credit any overpayment in fees to Attorney's Deposit Account No. 50-0481.

Respectfully Submitted,

Date: 3/17/00


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